Remarks

The Examiner rejects claims 13 and 15-25 as being obvious over Pennsylvania Department of Environmental Protection "Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania" and, in particular, Figure 7.12 ("the primary reference") in view of US 2005/0211019 to Crundwell. Applicant respectfully traverses because the proposed combination does not teach or suggest each of the limitations required by the claims.

The Examiner admits that the primary reference does not teach controlling the heat loss from the confined volume effectively to zero. The Examiner, however, looks to Crundwell and concludes that it would be obvious to perform the process of heap leach simulation of the primary reference including the step of controlling the heat loss from the confined volume effectively to zero in view of the teaching of Crundwell. The Examiner reasons that one of skill in the art would have been motivated to modify the primary reference in order "to mimic the auto-thermal phenomenon of heap leaching". Moreover, the Examiner rationalizes the modification as the simple substitution of one known element for another to obtain predictable results."

Applicant disagrees with the Examiner's reasoning and rationalization. Simply put, the prior art does not teach or suggest **controlling the heat loss** from the confined volume effectively to zero, as required by the claims.

The present invention relates to a method by which an operating biological heap can be simulated. The method includes a housing, i.e., a column apparatus that

represents a notional vertical pillar taken through the heap. Therefore, to simulate the insulating effect of the substantial ore mass that exists around any given pillar (that is of course not located at a heap boundary) and to replicate the leaching activity that occurs within the heap, the claimed column is provided with a plurality of temperature sensors and a plurality of independently controllable heating elements (i.e., sources). Each sensor and element **separately** measures and maintains the temperature of the ore material in a particular transverse columnar segment. Thus, in response to a monitored temperature from a particular temperature sensor, a particular respective heating element (source) is activated or deactivated to force the temperature gradient across the column walls of the respective transverse segment, effectively to zero. In other words, in response to the particularly measured temperature, electrical power may be supplied to the respective heating element or not, depending on the measured temperature. As a result, the temperature of each segment can be maintained independently of the temperature in vertically adjacent segments and the heat loss from the housing (confined volume) is effectively zero.

Advantageously, the claimed process provides a mechanism where high temperature zones (areas of effective bioleaching) can be detected and the position of such can be manipulated by varying process parameters such as liquid flow from the top and/or gas flow from the bottom, or by heating a particular segment with the respective heat source(s). In addition, the process of the present invention allows the measurement of the energy input from a particular heat source to a respective segment

to maintain the heat loss effectively to zero. This measurement is useful in determining the rate at which heat is lost via the liquid and gas flow streams.

In contrast, the neither the cited device (Figure 7.12) nor the described method of operating that device contemplate the above features of the claimed method. In fact, the device of Figure 7.12 is not capable of independent control of a plurality of heat sources necessary to simulate an operating heap leach with its vertically variant temperature zones. In other words, as admitted by the Examiner, the device of Figure 7.12 does not teach or suggest controlling heat loss from the confined volume, independently at a plurality of transverse segments, effectively to zero, as required by the claims. Quite the opposite, the primary reference teaches, for example, operation of the entire column at a fixed temperature of 50° C, which would necessarily result in heat loss from the column to the atmosphere.

Nevertheless, the Examiner looks to Crundwell to conclude that it would be obvious (Applicant points out that the correct standard is "would have been obvious", and will treat the Examiner's conclusion as such) to perform the process of heap leach simulation of the primary reference including the step of controlling the heat loss from the confined volume effectively to zero in view of the teaching of Crundwell. The Examiner's reliance on Crundwell is misplaced. There is nothing in Crundwell nor the primary reference that teaches controlling heat loss from the confined volume, particularly, controlling heat loss effectively to zero at differing vertical locations in the column with each vertical location likely having a different temperature.

Instead, the Examiner equates the auto-thermal phenomenon with controlling heat loss in the confined volume effectively to zero. The Examiner's premise is incorrect. The auto-thermal phenomenon described by Crundwell is that phenomenon where external heat no longer needs to be applied to the heap because the heat generated during the oxidation of the species in the ore (i.e. pyrrhotite) is sufficient and, as recognized by Crundwell more than sufficient. In fact, Crundwell points out that the bioleach tanks require cooling and that "cooling, rather than take-off, may be the greatest issue" (para. [0139]). Obviously, if cooling is required, heat is being extracted from the system and therefore, Crundwell teaches away from controlling heat loss effectively to zero.

Moreover, even when the bulk of the heap experiences an auto-thermal condition, Crundwell recognizes that a vertical temperature gradient exists in the heap since the heat generation in the cooler parts of the heap will be lower, further reducing the temperature in these areas ([para. [0107]). Thus, Crundwell's heap operation is opposite that of the primary reference, which seeks to maintain a constant temperature across the entire vertical height of the column. In view of these opposite operational parameters, the Examiner does not offer any rationale as to how one of skill in the art would bridge the gap.

The Examiner points to MPEP 2143 exemplary rationale (b) to argue that Crundwell's auto-thermal operation is a simple substitution of one known element of another. Yet, the Examiner does not articulate what part of the primary reference is

substituted for what part of Crundwell. Without specifying the actual substitution, the mere recitation of a rationale does not establish a *prima facie* case of obviousness.

In fact, as explained earlier, Crundwell's auto-thermal operation is contrary to the constant temperature operation of the primary reference and thus one would not substitute one for the other. Moreover, even if one were to make the substitution, neither the primary reference nor Crundwell teach or suggest (i) independently controllable heaters at different locations along the length of the column, (ii) each column segment requires a temperature measurement probe (in the primary reference, the thermocouple is used to monitor the temperature to verify that the temperature in the column is constant), (iii) a controller is needed to independently control, in respect of each column segment, the associated heater in response to the respective corresponding temperature measurement. In view of the significant differences between the cited art and the claimed invention, Applicant contends that the claimed methods are patentable. Therefore, Applicant requests the Examiner to withdraw the rejection and issue a Notice of Allowance.

The Examiner is invited to contact the undersigned attorney for the Applicant via telephone at (312) 321-4276 if such communication would expedite allowance of this application.

Respectfully submitted,

/G. Peter Nichols/
G. Peter Nichols
Registration No. 34,401
Attorney for Applicant

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200